DETR
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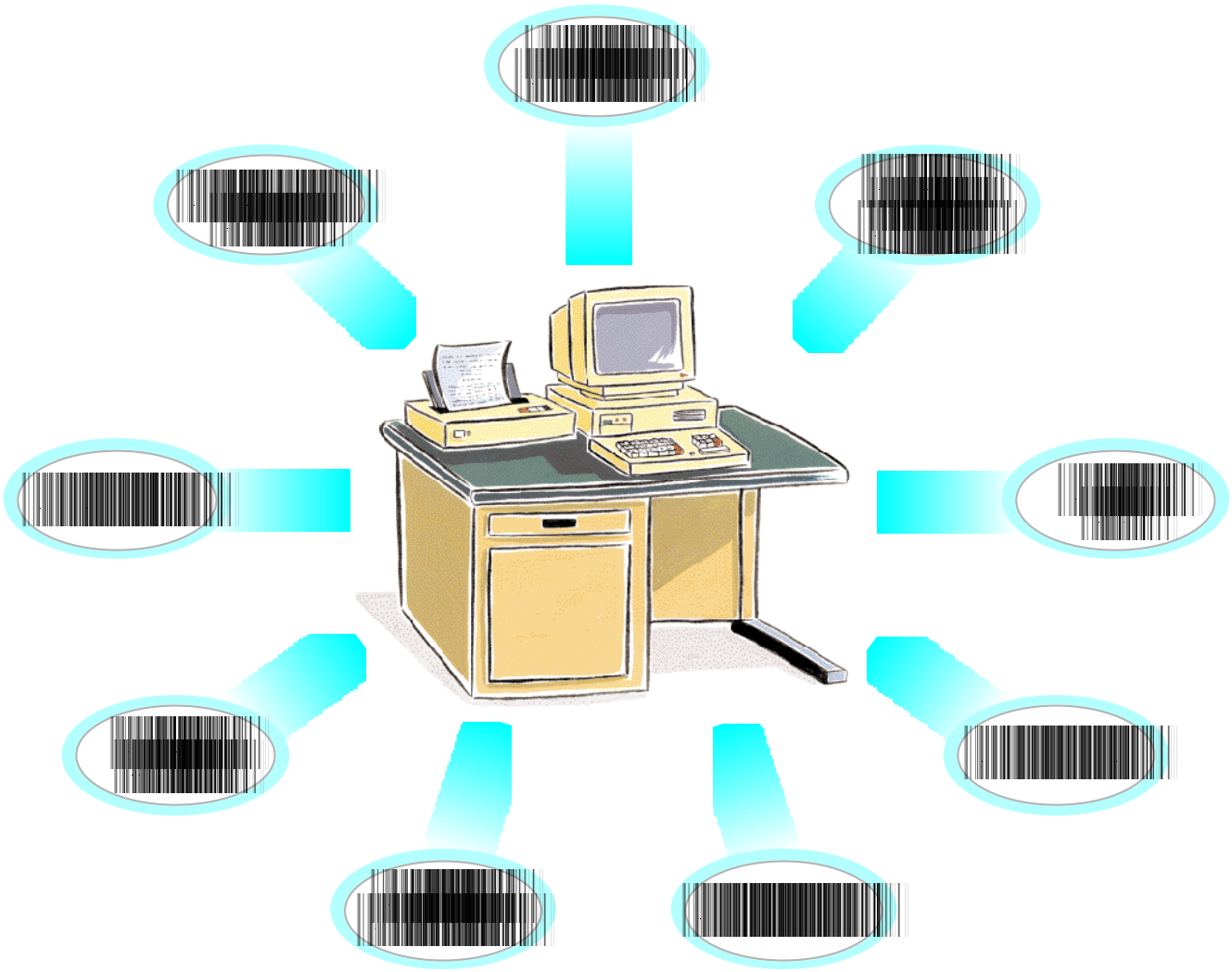
GOOD PRACTICE GUIDE 246

Building management systems

in further and higher education



ENERGY EFFICIENCY

BEST PRACTICE PROGRAMME

GOOD PRACTICE GUIDE 246

CONTENTS

1 INTRODUCTION

SUMMARY

The benefits of using a BMS within the FHE sector are that it:

- ***can provide energy cost savings of 10-20% compared to standard controls***
- ***can repay capital investment in 2-5 years***
- ***enables comfort conditions to be easily monitored and controlled from a single point***
- ***offers additional features, such as security, fire detection/alarm and teaching aids***
- ***enables easy allocation of energy use to specific cost centres***
- ***can easily be extended to cover future expansion and/or accommodate changing requirements.***

This Guide is aimed at introducing university estates and finance managers to the implementation of building management systems (BMSs) in further and higher education (FHE) establishments. It provides basic guidance on the features and benefits of using BMSs and illustrates this through four case studies.

The Guide shows that the advantages of BMSs are particularly appropriate to FHE establishments where services need to be flexible to satisfy the varied occupancy patterns of students and staff alike. In addition, many establishments have several disparate sites, each requiring control and maintenance, and a BMS will enable these to be managed from a central point. This approach will help to improve building and energy performance, reduce manpower requirements and provide greater comfort for occupants.

WHAT IS A BUILDING MANAGEMENT SYSTEM?

A BMS is a microprocessor-based system which provides the facility to control any building service. It works by using intelligent standalone controllers, or outstations, to accurately control plant such as boilers, pumps, fans, lights and security systems in response to changing conditions such as time, temperature and light levels.

A system can begin with a single outstation. This can be expanded at any time by adding further outstations and linking them via a simple communications network. The system can be enhanced by linking the outstations to a personal computer (PC) running appropriate applications software. This will act as a management tool, enabling all outstations to be monitored and adjusted from a central control point.

The ability to add to and expand a BMS gives it vast capabilities which are restricted only by cost and the user's commitment to control.

User commitment is essential to get the best out of a BMS; without it the system will just be an under-used facility. Put simply, BMSs provide an aid to management, not a substitute for it.

BMSs are not new technology, they have been in use for over 30 years. However, they have become increasingly popular in the last five years due to the lower cost of microprocessors and advances in computer software which make the systems much more user friendly.

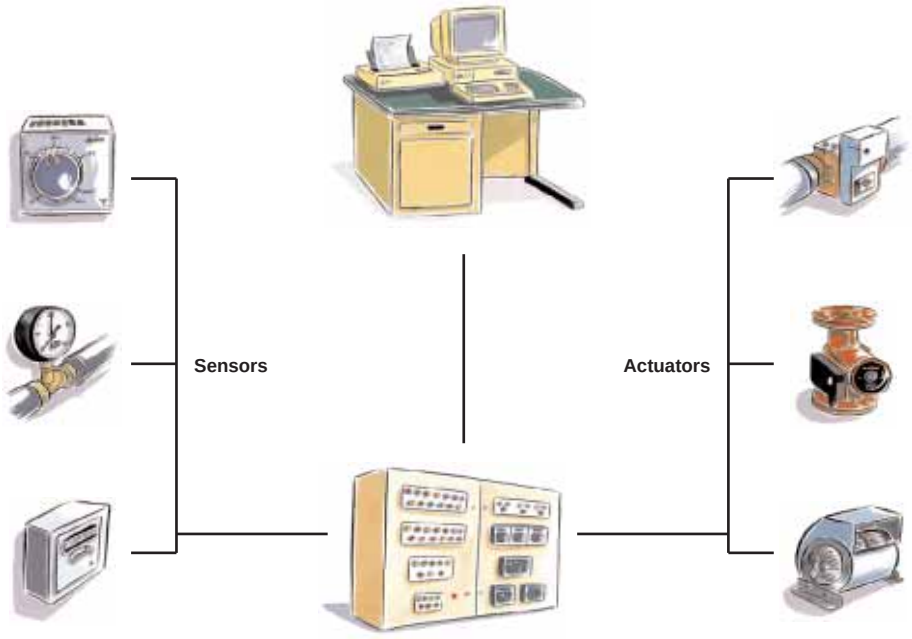


Figure 1 A basic BMS arrangement

2 SPECIFIC FEATURES OF A BUILDING MANAGEMENT SYSTEM

STATE-OF-THE-ART CONTROLS

A BMS provides the opportunity to replace all of the existing controls with state-of-the-art equivalents. These will provide closer control over the plant and will use the most accurate algorithms to ensure optimum performance.

EASE OF USE

The central control point, or supervisor, provides a single master control point from where the operator can look at what is happening at each outstation and make any adjustments to improve conditions or change parameters such as heating times.

The supervisor can simply be a standard PC onto which appropriate software has been installed. Old systems were often difficult to use and required a knowledge of computer programming codes. However, modern systems are designed to be much easier to use. Many have adopted the Windows™ structure of common menus, toolbars and command buttons, which most people are now familiar and comfortable with using. To assist in the operator's understanding, the system can also include schematics and images showing real-time conditions of the appropriate services.

As there is an opportunity for remote use, BMSs have security codes to prevent unauthorised access.

COMMUNICATIONS

Routine control of the system is carried out by the outstations which 'talk' to each other and to the supervisor through dedicated communications cables, or, in the case of a geographically remote site, via a telephone link.

This level of communication enables greater control to be achieved over the plant. For instance, on a site operating a district heating system, each outstation will constantly relay the building's exact heating requirements back to the central supervisor. This information will then be used to automatically adjust the operation and output of the boiler to meet demand.

Photograph courtesy of E-squared

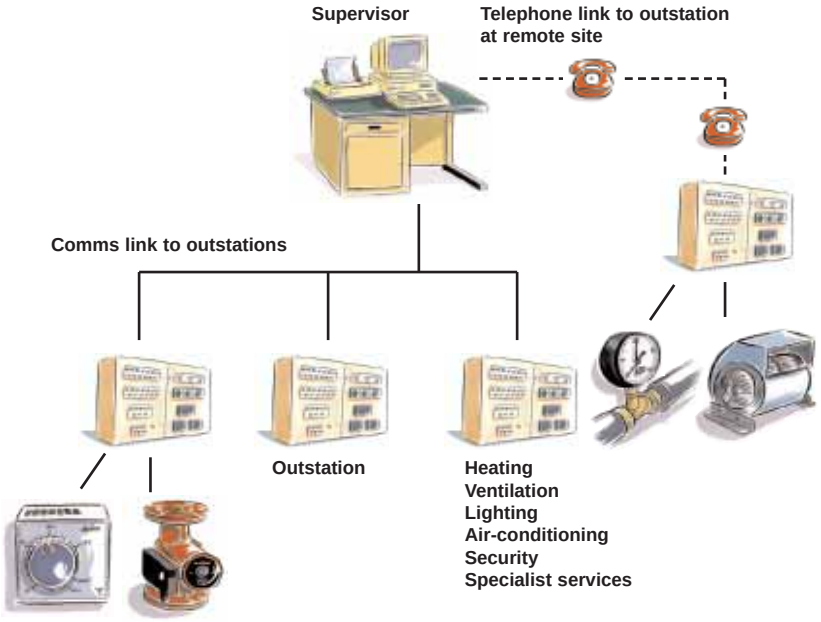
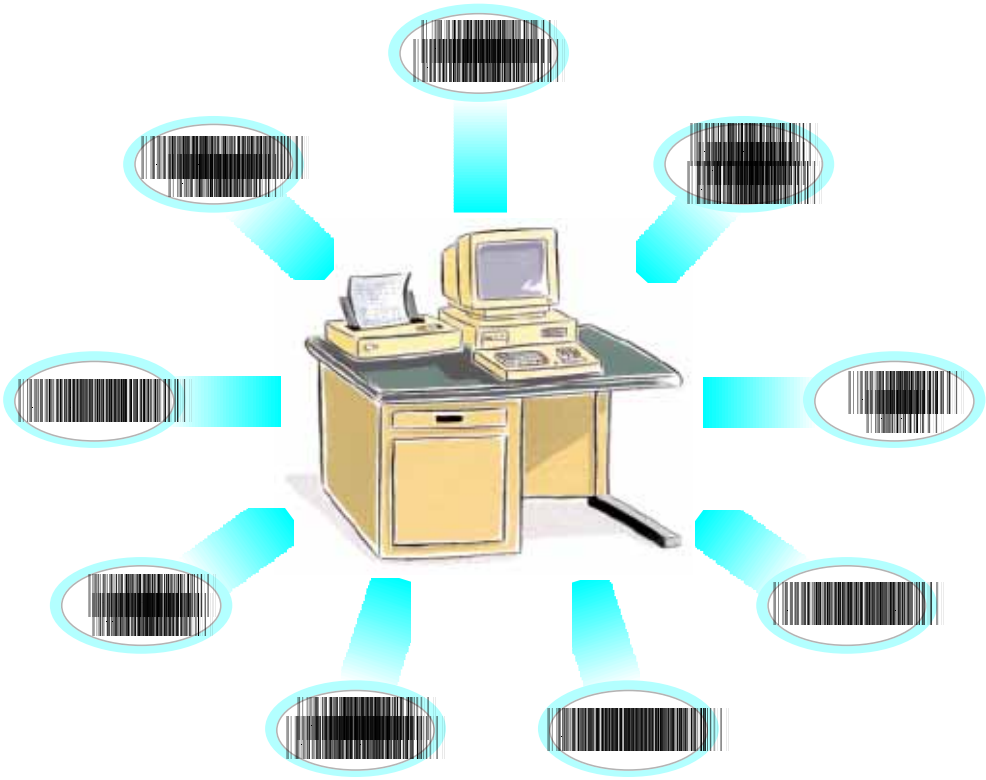


Figure 2 A BMS network

DATA LOGGING

The vast amounts of data being transferred across the system provide an ideal opportunity for determining fuel consumption, operating hours, room temperatures, etc. Software packages enable this data to be collated and assessed to produce details for trend analysis, building performance and maintenance scheduling.

3 BENEFITS AVAILABLE THROUGH BUILDING MANAGEMENT SYSTEMS



ENERGY SAVINGS

The introduction of state-of-the-art controls and communications provide savings by ensuring that the plant is operating at its peak efficiency whenever it is used and that it only operates when needed.

Studies have shown that, with careful management of the system, energy savings of 10-20% can be achieved while maintaining, or even improving, comfort conditions. It is, therefore, clear that these systems can play an important role in the environmental and energy strategy of universities and colleges.

(See case studies 1, 2, 3 and 4)

FLEXIBILITY OF USE

This benefit is particularly appropriate to universities and colleges, many of which now offer services such as:

- hosting conferences
- renting residences during holiday periods
- leasing individual rooms for specialist lectures
- running student union activities such as night clubs.

Each activity will have a different service requirement and will mean that the general patterns for heating, lighting, etc will frequently be changing. A BMS provides flexibility, allowing the specific needs to be programmed, providing comfort conditions when and where necessary.

Changes to programmes can be made through the supervisor either at the main console or other PCs on which the appropriate software is installed. This enables system changes to be made from remote sites or even from the operator's home. Certain changes can also be made locally at the appropriate outstation.

(See case study 3)

BENEFITS AVAILABLE THROUGH BUILDING MANAGEMENT SYSTEMS

MONITORING AND TARGETING

The data stored by the BMS can be readily transferred into standard monitoring and targeting (M&T) applications. This will encourage energy savings through comparison against targets and also allow resources to be targeted to improve efficiency in the poorer performing areas.

The information can also be fed into energy efficiency promotion campaigns in which students and staff are encouraged to adopt good housekeeping practices.

(See case study 4)

IMPROVED RELIABILITY

A BMS can improve the operating reliability of plant by enabling the operator to carry out routine checks and adjustments from the supervisory control point. The system can be set to indicate problems and provide alarms which will allow the maintenance staff to respond rapidly and rectify any situation before it gets critical. The system can also be used to auto-dial appropriate staff, including external contractors, to deal with specific problems as they occur.

A BMS will also enable the operating hours of various items of plant to be accurately recorded. This information can then be used within a planned preventative maintenance programme to avoid sudden and unforeseen breakdown of plant, thereby eliminating costly repairs and inconvenience due to plant failure.

(See case study 2)

MANPOWER COST SAVINGS

Manpower costs are often a major proportion of any building services budget. The use of a BMS will enable significant savings to be achieved through:

- providing control adjustments from a central point
- automatically taking meter readings
- improving planned preventative maintenance regimes
- extending the operating life of plant
- improving the environment within buildings which can delay the need for redecoration, repair and maintenance.

(See case studies 1 and 2)

IMPROVED COMFORT CONDITIONS

The improved control available through a BMS will provide managers with a tighter hold over environment and comfort conditions and achieve greater occupant satisfaction. By preventing overheating or overcooling, energy savings can also be achieved.

Furthermore, close control and monitoring of conditions will often enable the BMS operator to identify problem areas and to make appropriate changes to the comfort conditions before the occupant has noticed any discomfort.

(See case study 4)

BENEFITS AVAILABLE THROUGH BUILDING MANAGEMENT SYSTEMS

BUDGET CONTROL

Many FHE establishments now require individual departments to be responsible for their own finances, including utility costs. These are often based upon floor area used by the departments and not on energy/water used.

If appropriate, sub-meters are installed. A BMS can automatically monitor and record the energy use of individual areas. This information can then be used to bill the specific areas, departments or outside bodies for their actual energy use. This information will also be useful in assisting with the overall devolution of budgets.

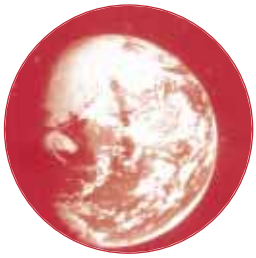
Furthermore, the improved knowledge of how and when energy is used will assist establishments in obtaining the most appropriate fuel tariff.

SECURITY, FIRE DETECTION AND ALARM

With the high level of computers and other information technology (IT) and specialist equipment, the matter of on-site security is a major concern. In addition to loss of property, the role of security extends to personal safety, which is of particular importance in residential sites where students are often vulnerable.

A BMS can be used to provide security. Once the basic communications network has been installed, the BMS can readily be extended to incorporate all standard security, fire detection and alarm systems, such as closed circuit television (CCTV), occupancy sensors, door and window release switches, smoke detectors, etc.

The BMS can even be used to contact the emergency services directly via a modem link.



ENVIRONMENTAL BENEFITS

Through improving control over building services, a BMS will benefit the environment by:

- reducing emissions of the principal greenhouse gas, carbon dioxide (CO_2), thereby helping to reduce the risk of global warming
- reducing emissions of sulphur dioxide (SO_2), the major contributor to acid rain
- helping to conserve the world's finite energy resources and water supplies
- extending plant and building life through improved operating conditions and maintenance regimes.

4 WHEN IS A BUILDING MANAGEMENT SYSTEM APPROPRIATE?

Since the cost of outstations is little more than that of standard controls, the opportunity to install a BMS should be taken with all new building and refurbishment projects.

Individual outstations can significantly improve local control. However, the full benefits of a BMS will only be seen once it becomes widespread and the advantages of the communications network and central control unit are realised. To this end BMSs are particularly beneficial in:

- multi-building sites
- sophisticated buildings
- multi-site complexes
- facility-managed buildings.

FUNDING OPTIONS

There are various ways in which funding can be found for BMS installation, operation and maintenance. The most common ways are:

- outright purchase from internal budgets
- commercial loans
- grant-aided funding
- Private Finance Initiative (PFI) funding
- Contract Energy Management (CEM)
- energy services companies (ESCOs).

Through PFI, CEM and ESCOs, specialist companies will provide funding and management expertise to help finance the installation. The companies will then generally operate the system on your behalf and share in the savings achieved.

See page 16 for further information on BMS systems.

CONSIDERATION OF A PARTIAL BUILDING MANAGEMENT SYSTEM INSTALLATION

Financial or other constraints may mean that you are not at present in a position to install a BMS to cover your whole site. However, this should not deter you from considering a partial installation.

Build the BMS for areas where most benefit will be gained. These may be:

- **particular services**, such as heating or lighting
- **specific buildings**, such as ones which are geographically remote, require flexible control, or have complex building services.

As long as provision has been made in choice of the central unit and software, then additional outstations and services can be added at a later date.

(See case studies 1, 2, 3 and 4)

WHAT IF I ALREADY HAVE A BUILDING MANAGEMENT SYSTEM?

Existing partial building management system

You may already have a BMS covering part of your site and wish to extend its coverage. This can generally be achieved by adding outstations to the existing system.

At present, it is necessary to remain with a single supplier. However, the controls industry is planning to standardise its equipment, which means that you will eventually have the freedom to shop around.

Software improvement

If your existing BMS is less than 10 years old it may be possible to upgrade it by installing new software which presents a greater amount of information in a more user-friendly way.

5 STEPS TOWARDS A BUILDING MANAGEMENT SYSTEM INSTALLATION

IDENTIFY OPPORTUNITIES AND GET SUPPORT

The installation of a BMS will be most appropriate in situations where existing controls are in need of replacement where new buildings or services are being installed. Earmark such situations as opportunities for installing a BMS.

Generate support among key departments and staff – a preliminary case for a BMS can generally be established with little research. The financial justification for a BMS should include a full life cycle costing calculation based on discounted cash flow. Estimates of potential savings should, where possible, account for contributions from improved maintenance and increased reliability, in addition to reduced energy consumption. The information and case studies in this Guide can also be used to illustrate the benefits of BMSs and their success in other FHE establishments.

DETERMINE REQUIREMENTS

Establish what you want the BMS to do and the areas that you want to cover. Be careful not to be too ambitious; justify every area and item of plant covered by the system. Consider future plans for the site – it may be wise to make plans now for possible changes in the site's size or pattern of use.

Free surveys

Take advantage of the free surveys which many equipment suppliers offer. Use a number of suppliers so that different approaches can be compared.

DESIGN AND SPECIFICATION

Use independent external consultants to provide a detailed specification which precisely defines the scope, extent and nature of the system, so that there is a full understanding of what the BMS will deliver. The specification should detail both the immediate and long-term plans for the BMS and provide a phased programme for installation.

Supplier

The industry is currently non-standard and it is, therefore, important that an appropriate supplier is chosen, as you will be committed to them for future system developments, maintenance and support. The specification should state the equipment supplier to be used (information on suppliers and their products can be obtained from the Buildings Control Group (BCG) whose details are given on page 16).

TENDERING

Tenders should be invited from the specified supplier and a number of contractors. The work can be tendered on a phased basis whereby costs for individual elements of the installation are provided and are fixed or indexed for a period of 5-10 years. This will allow you the option of proceeding with the whole installation or to pick certain aspects for immediate installation and develop the remainder over a phased programme without fear of substantial price increases.

When assessing the tender, pay attention to ongoing costs, such as maintenance, support and call-out charges. These can be expensive and should also be fixed or indexed for a period of 5-10 years.

OVERSEE INSTALLATION AND COMMISSIONING

Project management should be undertaken to ensure that the installation is carried out satisfactorily and that the system fully complies with the specification.

The system should be thoroughly checked to ensure that it is operating satisfactorily. It is important that suppliers and contractors are fully committed to this stage, since with the extent of any new BMS there will undoubtedly be initial equipment, hardware, communications and calibration faults.

Make sure not only that the system works correctly but also that the supervisor's computer interface is as comprehensive and user friendly as required.

DOCUMENTATION

The system should be fully documented, including a full set of installation drawings and comprehensive details of the supervisor interface software and graphics.

TRAINING AND SUPPORT

Key members of staff should receive thorough training in both the computer and services aspects of the system. As a minimum, the staff should be able to:

- understand the supervisor displays and be able to operate all necessary commands
- make necessary minor programme changes
- carry out minor manual adjustments to control points
- install basic additional points.

Table 1 Key steps towards a BMS installation

STEPS TOWARDS A BUILDING MANAGEMENT SYSTEM INSTALLATION

PITFALLS

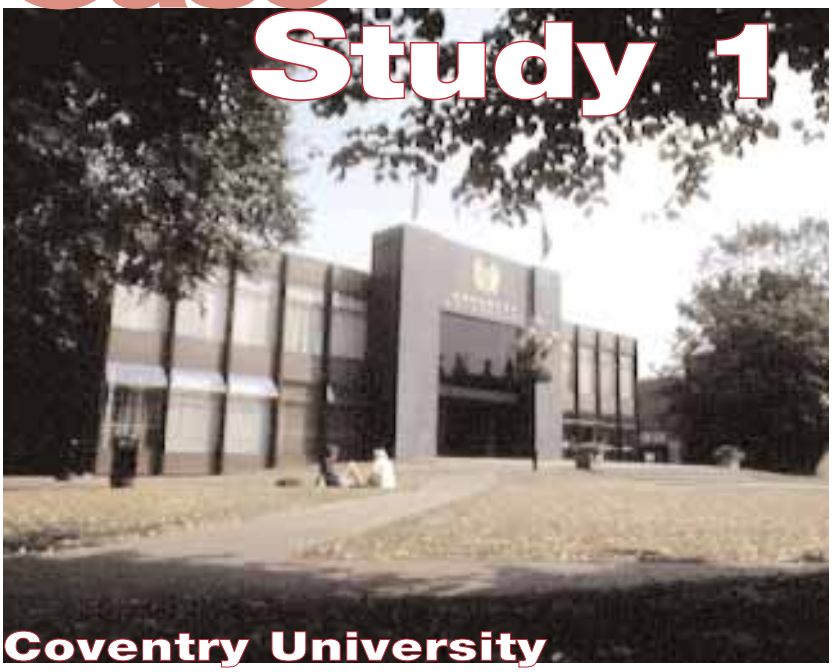
Before proceeding with a BMS installation, consideration should be given to the factors which may limit its success. These are as follows.

- **Suitability of existing buildings and plant.** A BMS can operate most effectively when the buildings are separated into zones so that the areas with different requirements, such as lecture rooms, libraries and sports halls, can be controlled appropriately and independently.
- **Use of existing controls.** It is sometimes possible to reduce installation costs by incorporating existing controls, such as optimisers, into a BMS. However, the best results will be achieved by replacing all of the existing controls with state-of-the-art equipment. This will provide closer control over the plant and will use the most accurate algorithms to ensure optimum performance.
- **Correct operation and maintenance.** The existing plant may not be able to respond effectively to the level of control available through a BMS. It may, therefore, be necessary to repair or replace existing plant to gain the full BMS benefits.
- **Staff involvement and commitment.** In order for a BMS to operate to its potential, the staff closely involved in its operation will have to be committed to its success and must be willing to incorporate it into their existing ways of working. For instance, if you plan to use the BMS for devolved budgeting, can your finance department accommodate it, and are the departments affected by it prepared to accept the change? There is less chance of success if you impose a method of working which is alien to your institute.

It is important to recognise that a BMS provides an aid to management and is not a substitute for it.

6 CASE STUDIES

Case Study 1



Coventry University

KEY POINTS

- **Buildings served**
  95% of total site
- **Services covered**
  Heating
  Ventilation
  Air-conditioning
  Lighting
  Security
  Fume cupboards
- **Finance**
  Internal
- **System cost**
  20-year phased programme, £450 000 invested to date
- **Annual savings**
  Currently estimated at £250 000
- **Payback**
  2-3 years for each phase

Phased growth of a comprehensive building management system

In 1980, the Local Education Authority (LEA) grant to Coventry University was reduced and the University had to find ways of cutting costs. Energy savings were seen as one way forward.

The Estates Department was aware that it could save energy through improving the control of its buildings and appreciated that BMS offered it the means of achieving this.

Funding was limited and so a rolling programme was developed for phased introduction of BMS over several years. To this end, the University was only interested in manufacturers and systems which could evolve technically and remain compatible for at least five years.

Initial phase

In 1981, the halls of residence were being updated to accommodate conference leasing and were seen as having significant potential for improvement.

The University had considered using up to 16 optimisers to control the heating system but saw that a BMS could be installed for little additional cost. In addition, this would offer many management facilities which were not possible with conventional controls.

A BMS was installed for a total cost of £66 000 including outstation and supervisor unit.

The performance of the system was closely monitored and showed that the annual fuel costs for the residences were cut by £35 000 (20%), giving a payback of just two years.

Phased expansion

The success of Phase 1 was used to promote the case for a BMS and the slow expansion began.

Through the inclusion of a BMS in refurbishment and new-build projects, the BMS has been extended to control and monitor more than 95% of the mechanical plant throughout all of the University's buildings. This includes remote sites and even a town centre nightclub.

The system has also been extended to cover other services, such as:

- ventilation
- air-conditioning
- lighting
- security
- specialist services, such as fume cupboards.

To date, the overall BMS installation has cost around £450 000.

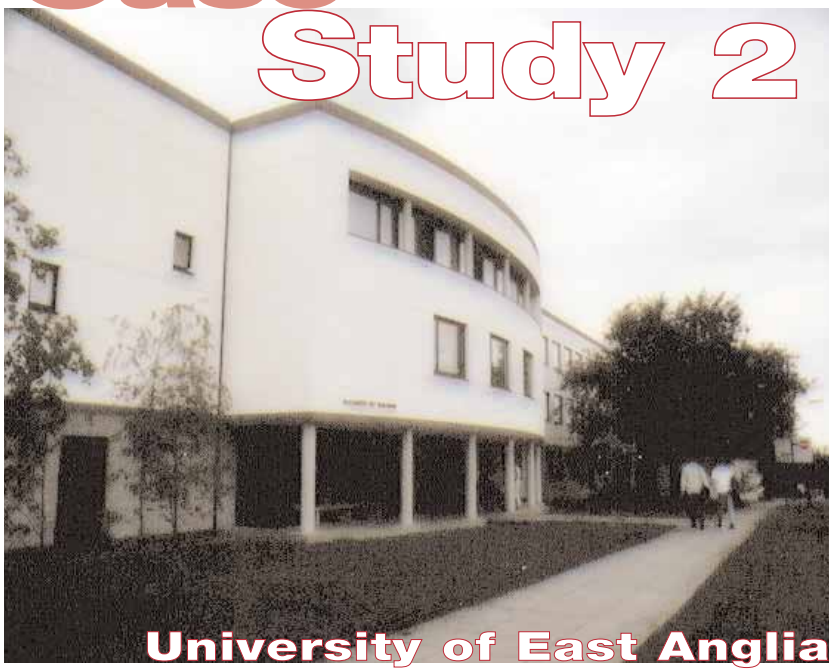
Cost benefits

In 1980, there were around 5000 students at Coventry University and the annual fuel bill was £750 000. Student numbers have now trebled to 15 000 but the fuel bill has only risen to £1 million per year. The Energy Manager estimates that this bill would be at least £250 000 higher per year without energy savings achieved through the BMS.

'Through starting in an area where significant benefit could be proved, we have achieved substantial energy savings and developed a case for expanding the BMS throughout the University.'

Jim Skelhon – Energy Manager

Case Study 2



Heating controls in a campus university

In the early 1990s, the University of East Anglia decided to install a BMS to help it control its energy and maintenance costs.

The key factors required by the University Estates Department were that the BMS:

- is simple to use
- enables remote operation of the boiler plant
- gives alarm signals.

Financial limitations meant that the system would have to be installed on a phased programme – addressing areas of most benefit first, then extending across the campus.

Phase 1

A survey of the University's district heating system revealed that many of the controls in the main boiler house were beyond their useful operating life, and that the system was inefficient and taking up much of the maintenance team's time.

This represented an ideal area to introduce the BMS. Installation in this and other, smaller, problem areas was carried out between 1995 and 1998.

The cost of Phase 1 was £95 000. However, during the three years since installation, energy savings of £50 000 and manpower savings of almost £70 000 were achieved which more than repaid this investment.

Phase 2

This involves extending the coverage of the BMS to control space heating in all major buildings on the site and is due to be completed in 2007, bringing the total BMS cost up to £400 000. When the system is fully operational, the University expects to achieve cost savings of up to £250 000 per year through improved operating efficiency (£150 000) and reduced staff numbers (£100 000).

The system uses a comprehensive, user friendly graphics package to provide information on the status of plant and room conditions. Three members of the University staff have been trained in its use and they can now easily control and programme the system.

Particular advantages of the system have been identified as follows.

- **Improved planned maintenance.** The BMS monitors the condition of plant and the amount of time each item is in use. This information is used to minimise maintenance time by enabling the operators to identify when items of plant are in need of attention.
- **Improved breakdown response.** The information provided by the BMS also enables the operator to identify any gradual reduction in plant performance. The maintenance team uses this to alleviate any problem before it decays too far and causes plant failure or occupant discomfort.
- **Automatic meter reading.** There are over 200 utility meters on the University campus and these have previously been read manually every month. The BMS is being extended to do this task automatically which will save around 40 man hours per month.

KEY POINTS

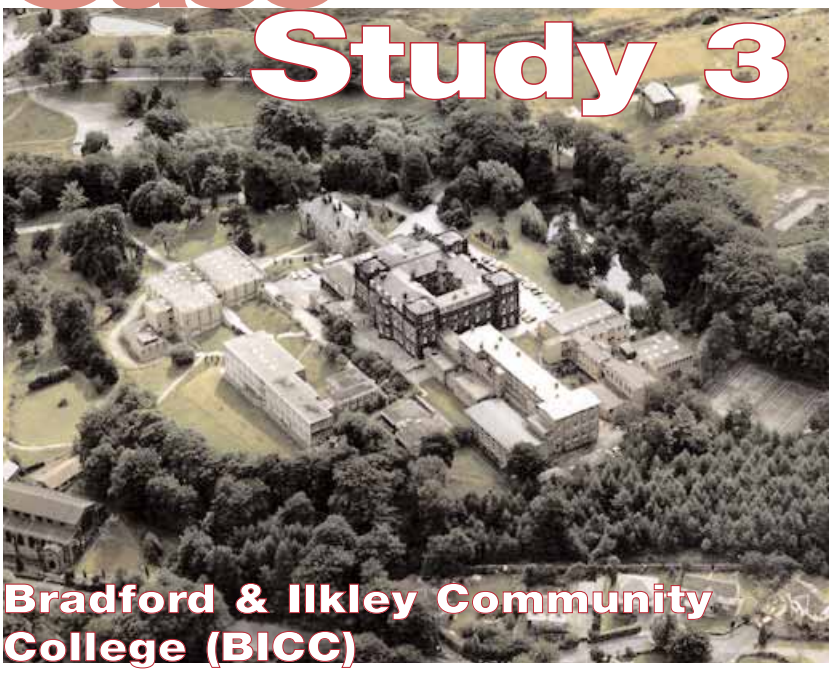
- **Buildings served**
  Phase 1 – Main boiler house
  Phase 2 – Remainder of site
- **Services covered**
  Heating
  Ventilation
  Air-conditioning
- **Finance**
  Internal budget and Higher Education Funding Council (HEFC) grant
- **System cost**
  £400 000 invested over a 10-year phased programme
- **Annual energy savings**
  Estimated at £150 000 at end of programme
- **Manpower savings**
  Estimated at £100 000
- **Payback**
  2-3 years for each phase

'The use of a BMS will enable us to greatly improve our control over the services, improving customer comfort and reducing energy and staff costs.'

Martin Newton – Building Services Engineer

CASE STUDIES

Case Study 3



Bradford & Ilkley Community College (BICC)

KEY POINTS

- **Buildings served**
  75% of the main site and remote sites
- **Services covered**
  Hot water, heating
  Ventilation
  Air-conditioning
- **Finance**
  Internal budgets
- **System cost**
  Total system cost £90 000 invested over an 11-year phased programme
- **Annual energy savings**
  Not determinable
- **Manpower savings**
  Total estimated at £100 000

McMillan Building
System cost = £13 000
Energy savings = £3500 per year
Payback = 3-4 years

Pragmatic expansion of a building management system

Following the miners' strike and oil crisis of the early 1980s, BICC decided to move its dependence away from these fuels and standardise on gas-fired heating systems. The major works required for this provided an ideal vehicle for introducing a BMS.

Installation

The College adopted a pragmatic approach to the introduction of a BMS. This involved identifying those buildings in which the greatest benefits could be achieved and addressing those first. In prioritising their buildings, the College gave consideration to:

- the adequacy of existing controls
- the opportunity for improving comfort conditions
- the potential for energy cost savings
- the opportunity for manpower savings.

The first phase saw the introduction of controls and outstations into two buildings and the installation of a central supervisor to enhance the management facility. The BMS has been gradually expanded at the rate of two to four buildings per year and currently extends to 40 outstations covering most aspects of heating, hot water, ventilation and air-conditioning within both the main campus and remote sites.

The current total installation cost is estimated at £90 000 and has been paid for entirely from existing estates budgets.

Improved comfort

The introduction of a BMS has produced many benefits for the College, one of the most important of which is improved comfort.

Prior to the installation of the BMS, many buildings were inadequately heated. Heating often came on late, turned off early and would not respond to changes in requirements, all of which led to occupant dissatisfaction. Through the BMS, these problems have been eradicated and occupant satisfaction has improved considerably.

Energy cost savings

Through the move to a single fuel and the introduction of BMS controls, the College has achieved significant savings in its energy use. Heating costs have reduced from well over £300 000 in 1986 to a current cost of just £200 000.

Changes in building use, comfort levels and fuel prices mean that the specific cost benefits of a BMS are difficult to determine. However, the McMillan Building represents one building where conditions have remained constant and substantial savings can be illustrated.

In this building, the BMS sensors and outstation were installed for a capital outlay of £13 000 and, allowing for variations in fuel prices, have produced annual energy costs savings of £3500.

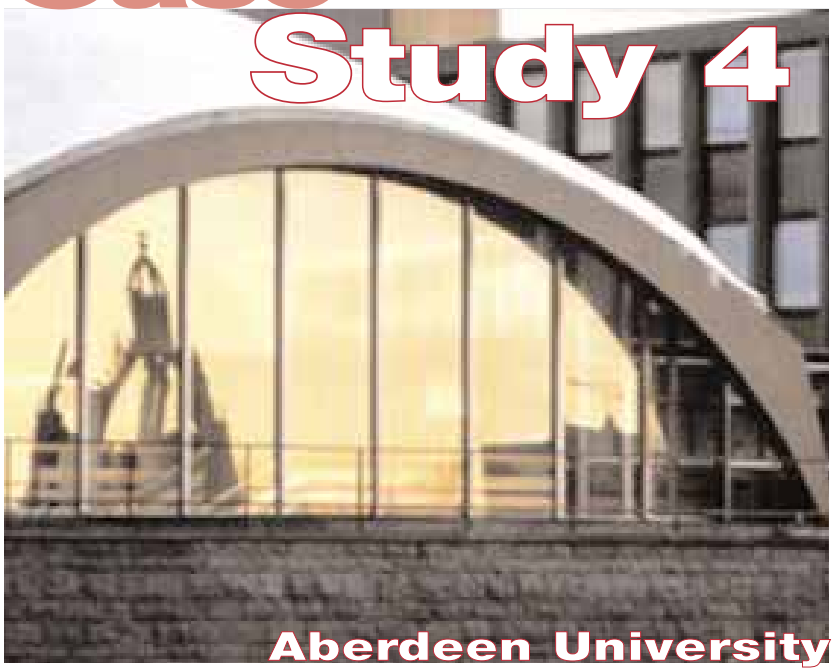
Manpower savings

Improved reliability and control has enabled the College to reduce its maintenance staff by seven through an early retirement scheme (no redundancies were necessary). This has provided an additional cost saving of over £100 000 per year.

'The pragmatic approach to installing a BMS has enabled us to achieve comprehensive coverage, improving comfort conditions and providing substantial cost benefits.'

Steve Bamford – Energy Manager

Case Study 4



Benefits of monitoring and targeting

Aberdeen University is one of the oldest universities in Scotland, having been granted its charter in 1495.

The University buildings range from ancient to modern with 15th century stone alongside 1970s concrete, but all benefit from the close control provided by the BMS.

In 1992, the University began a programme of refurbishing its many plantrooms. In parallel with this, the University decided to replace the existing controls with a BMS with the intention of achieving comprehensive site coverage in a few years.

Through this phased programme, the BMS has been expanded to control services for 20 buildings covering the vast majority of the University's three sites.

The BMS is mainly used to control the heating system, but also covers other services around the University as is deemed necessary.

Monitoring and targeting

As an integral and important part of the BMS, a comprehensive steam metering network was installed. All meters are monitored by the BMS and this allows the University to map accurately its energy consumption, identify problem areas through trend analysis and take corrective action to minimise energy use.

Cost savings

The overall cost of installing the BMS has been difficult to determine, as the University no longer considers analogue controls when upgrading plantrooms. However, the University is satisfied that the small over-cost of BMS controls has been repaid through significant cost savings. This has been amply demonstrated in the McRobert Building which has recently been upgraded.

The BMS for this building was installed for a cost of £75 000 which represented an over-cost of £7500 compared to conventional analogue controls. However, through the improved control and targeting offered by the BMS, energy savings of an estimated £15 000 have been achieved during the first year of use.

Other benefits

Another area benefiting from the improved controls is the swimming pool. While the introduction of the BMS has not produced energy savings, it has improved the environment to such an extent that the maintenance requirements for decoration have reduced significantly and provided unexpected cost savings.

The BMS is also used by some departments to provide monitoring and control over room environments and for specialist services such as critical freezer alarms. In two of the current applications, the relevant departments can use touch screen technology for accessing the BMS to view monitored data or to change parameters.

KEY POINTS

- **Buildings served**
  70% of academic buildings
  20% of residential buildings
- **Services covered**
  Hot water, heating
  Ventilation
  Air-conditioning
  Refrigeration
- **Finance**
  Internal budgets
- **System cost (McRobert Building)**
  Estimated at £75 000
- **Annual energy savings (McRobert Building)**
  Estimated at £15 000
- **Manpower savings (McRobert Building)**
  Improved efficiency but no savings
- **Payback (McRobert Building)**
  Estimated at five years

'The BMS is an essential tool in our energy monitoring strategy and has helped us to achieve substantial cost savings.'

John McManus – Estates Director

FURTHER INFORMATION

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Buildings Control Group (BCG)
Further information on building management systems can be obtained from:
Buildings Control Group, Energy Systems Trade Association, PO Box 1397, Highworth, Swindon SN6 7UD. Tel/fax 01793 763556.

FURTHER READING

Chartered Institution of Building Services Engineers (CIBSE)

- Applications Manual 6 Contract Energy Management

Delta House, 222 Balham High Road
London SW12 9BS.
Tel 0181 675 5211. Fax 0181 675 5449

DETR ENERGY EFFICIENCY BEST PRACTICE PROGRAMME DOCUMENTS

The following Best Practice programme publications are available from BRECSU Enquiries Bureau. Contact details are given below.

- Energy Services for the Public Sector – An Executive Summary
- Energy Services for the Public Sector – A Working Guide
- Standard maintenance specification for mechanical services in buildings Vol 3: Control, energy and building management systems

Fuel Efficiency Booklet

10 Controls and energy savings

Energy Consumption Guide

54 Energy efficiency in further and higher education – cost-effective low energy buildings

Good Practice Case Studies

16 Energy efficiency in offices. Heslington Hall, University of York
42 Energy efficiency in higher education buildings: condensing gas boilers
334 The benefits of including energy efficiency early in the design stage – Anglia Polytechnic University
335 Investment in energy efficiency at the University of Warwick
336 Energy efficiency in further and higher education – monitoring and targeting. University of Wales, Cardiff

Good Practice Guides

182 Heating system option appraisal – a manager's guide
204 Combined heat and power (CHP) in universities
207 Cost-effective low energy buildings in further and higher education

New Practice Final Report

102 The Queen's Building, De Montfort University – feedback for designers and clients

The Department of the Environment, Transport and the Regions' Energy Efficiency Best Practice programme provides impartial, authoritative information on energy efficiency techniques and technologies in industry and buildings. This information is disseminated through publications, videos and software, together with seminars, workshops and other events. Publications within the Best Practice programme are shown opposite.

For further information on:

Buildings-related projects contact:
Enquiries Bureau

BRECSU
BRE
Garston, Watford WD2 7JR
Tel 01923 664258
Fax 01923 664787
E-mail brecsuenq@bre.co.uk

Industrial projects contact:
Energy Efficiency Enquiries Bureau

ETSU
Harwell, Oxfordshire
OX11 0RA
Tel 01235 436747
Fax 01235 433066
E-mail etsuenq@aeat.co.uk

Internet **BRECSU** – http://www.bre.co.uk/brecsu/
Internet **ETSU** – http://www.etsu.com/eebpp/home.htm

Energy Consumption Guides: compare energy use in specific processes, operations, plant and building types.

Good Practice: promotes proven energy efficient techniques through Guides and Case Studies.

New Practice: monitors first commercial applications of new energy efficiency measures.

Future Practice: reports on joint R&D ventures into new energy efficiency measures.

General Information: describes concepts and approaches yet to be established as good practice.

Fuel Efficiency Booklets: give detailed information on specific technologies and techniques.

Introduction to Energy Efficiency: helps new energy managers understand the use and costs of heating, lighting etc.

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